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ABSTRACT

This paper offers a summary analysis of 4 years of interviews with 1,003 kindergarten and first through third grade teachers regarding their experience in teaching either a small class, a regular size class, or a regular size class with a full-time teacher's aide. The paper uses teachers' descriptions of their experience to explore the effect of reduced class size or reduced teacher/pupil ratio on developmental appropriateness of primary grade curriculum and on adult-child interaction. Current class size research is briefly sketched. The paucity of findings regarding classroom processes is noted. Next, Project STAR, a 4-year longitudinal study of effects of reduced class size and teacher/pupil ratio in kindergarten through third grades is described. Results of the teacher interviews are summarized and discussed in relation to the National Association for the Education of Young Children's position statements on developmentally appropriate practice in the primary grades. It is concluded that small classes of about 15 students and regular size classes of about 25 students and a full-time aide contribute to a primary grade experience that is more congruent with the developmental and learning needs of students than is the experience of proportionally larger classes. (RH)

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Relations Between Reduced Class Size and Reduced Teacher/Pupil Ratio and Developmentally Appropriate Practice in Kindergarten Through Third Grades

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Relations Between Reduced Class Size and Reduced Teacher/Pupil Ratio and Developmentally Appropriate Practice in Kindergarten Through Third Grades

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The first purpose of this paper is to report a summary analysis of four years of interviews with 1,003 kindergarten, first, second, and third grade teachers regarding their experiences teaching either a small size class, a regular size class, or a regular size class with a full-time teacher's aide. The second purpose is to employ these teachers' descriptions and explanations of their experiences to explore how reducing class size or reducing the teacher/pupil ratio can affect the developmental appropriateness of primary grade curriculum and adult-child interactions. In short, this question is addressed: How does significant reduction in the number of children in a class, or the addition of a full time teacher's aide affect developmentally appropriate practices in K-3 primary grade public school classrooms?

To accomplish these purposes the current state of class size research is briefly sketched, noting particularly the paucity of findings regarding classroom processes. Next, Project STAR, a four year longitudinal study of the effects of reduced class size and reduced teacher/pupil ratio in primary grades K-3 will be introduced. Since Project STAR is the data source for this present paper, its primary design features will be presented, and the more specific teacher interview data collection and analysis procedures will be provided. The results of the K-3 teacher interviews (1986-89) will be summarized, and then will be discussed in relation to the National Association for the Education of Young Children's position statements on developmentally appropriate practice in the primary grades, serving 5- through 8-year olds (Bredekamp, 1987).

The Issue of Optimal Class Size

There are few questions in education which have been studied more extensively or more inconclusively than the issue of optimum class size. Most teachers and indeed most parents believe that smaller is better, that reduced class size will result in increased pupil achievement. Individual class size research studies and reviews of research on the relationship between class size and pupil achievement have produced diverse and often contradictory findings and policy interpretations for different grades and groups of pupils (Cahen, Filby, McCutcheon & Kyle, 1983; Glass, Cahen, Smith & Filby, 1982; Robinson & Wittebols, 1986; Tomlinson, 1988).

However, comprehensive critical reviews of research on class size and pupil achievement (Klein, 1985; Mitchell, Carson, & Badarak, 1989; Robinson & Wittebols, 1986; Ryan & Greenfield, 1975), and recent large scale evaluation studies (Achilles, Bain, Folger, Johnston, & Lintz, 1987, 1988; Mueller, 1987; Word, Bain, Folger, Johnston, & Lintz, 1989) strongly support the conclusion that significant reduction of class size will facilitate increased pupil achievement. More specifically, research supports the contention that small classes are important to increased pupil achievement in reading and math in the early primary grades. In sum, convincing evidence now exists to support the conclusion that significantly reducing the number of pupils in a primary grade classroom results in increased pupil achievement scores on standardized tests of reading and math. The reasons that small class pupils achieve more are not nearly so apparent. Class size is a facilitative rather than a causative variable. Just <u>what</u> changes in teaching and learning are facilitated; just <u>how</u> classroom life in small size classes differs from life in regular size classes is not well known.

Thus, what is missing in the contemporary policy debate about optimal class size is knowledge of what changes actually occur in classrooms when class size is reduced or when teacher/pupil ratio is reduced by use of full time teacher aides.

Reviewing 22 studies of class size and teaching practices, Robinson and Wittebols (1986) conclude that smaller classes tend to promote the use of more desirable teacher practices; noting correctly however, that smaller classes do not guarantee that teachers will take advantage of having fewer pupils and modify their teaching practices. Teachers in small size classes were found to use more desirable classroom practices such as more attention to individual children, and more individualization of instruction. In a review of nine studies using direct classroom observations to measure teaching practices in larger and smaller classes, Robinson and Wittebols (1986) report six found no significant difference in teaching practices; and 3 found teachers in smaller classes using more desirable practices.

Attention to the effects of reduced class size and reduced teacher/pupil ratio is timely as reform minded states and local school systems reduce the number of pupils in classes and assign full time teacher aides as a means of improving pupil achievement. Swan, Stone and Gillman (1987) report that at least 20 states have implemented or are developing programs to reduce class size in the primary grades. In particular, reduction of class size and reduction of teacher/pupil ratio through use of full time teacher aides are strategies which are increasingly being employed by large metropolitan school districts as a means of addressing poor basic skill performance by minority children and children identified as at-risk for school failure.

Overview of Project STAR

The Tennessee Legislature authorized a statewide 12 million dollar, four year, longitudinal demonstration policy study to consider the effects of class size on pupils in primary (K-3) grades. The Student/Teacher Achievement Ratio project (Project STAR) began in August, 1985 with representatives from Memphis State University, Tennessee State University, University of Tennessee-Knoxville, Vanderbilt University, the State Department of Education, the State Board of

Education and the State Superintendent's Association working in a consortium to design, conduct, and monitor the project. The results reported in this paper represent only a small portion of this larger study (Achilles et al., 1987, 1988; Word et al., 1989).

Project STAR's enabling legislation mandated that participating schools should represent Tennessee's population of inner-city, urban, suburban, and rural schools; and should also be drawn from all three geopolitical divisions of the state. There were 79 schools in 42 school systems that participated in the study. Consideration of the comparisons required by the legislation, as well as other variables, led to development of a within school design. Project staff randomly assigned teachers to each of three class types: small classes (*S*, 13-15 pupils), regular classes (*R*, 22-25 pupils), and regular classes with full time teacher aides (*RA*, 22-25 pupils). The over 7,000 pupils involved in Project STAR were also randomly assigned to each of the three class types by project staff. In general, pupil outcome data were collected regarding academic achievement, academic self-concept and motivation, attendance, and promotion/retention and special education referral status. Age, race, sex, and SES data were also gathered on each pupil. Information was collected regarding parent-teacher interaction, classroom grouping practices, and use of time, and teachers perceived problems. Exit interviews were conducted with teachers at the close of each school year.

Teacher Exit Interview Data Source and Procedures

The annual Teacher Exit Interview protocols were the data source for this present paper. Interviews were conducted by representatives of the university consortium in May 1986, 1987, 1988, and 1989 with 128 *S* kindergarten teachers, 126 *S* first grade teachers, 86 *S* second grade teachers, 88 *S* third grade teachers; 101 *R* kindergarten teachers, 113 *R* first grade teachers, 54 *R* second grade teachers, 55 *R* third grade teachers; 99 *RA* kindergarten teachers, 107 *RA* first grade teachers, 71

RA second grade teachers, and 70 *RA* third grade teachers. In sum, over a four year period 1,003 kindergarten, first, second, and third grade teachers participated in related structured, year-end interviews.

Kindergarten teacher interviews. The primary question explored in depth with each Project STAR kindergarten teacher was: If your experience was different this year than last year, then how was it different? A three stage iterative analysis was performed on the first year (kindergarten) data. In the first stage the protocols were examined to identify and define common themes. In the second stage protocols were categorized along the dimensions of those themes. In the third stage a random set of responses, which had been set aside at the outset of the analysis, was used to check the reliability of the theme categories and the coding process. Examination of the 328 kindergarten teacher interviews revealed 17 distinct categories. Three categories addressed project procedures and pupil characteristics and are not addressed in the present analysis. Fourteen categories were identified to address teachers' perceptions of teaching either in a small class, a regular class with no aide, or in a regular class with a full-time aide. Each category is described below.

Grouping of pupils - Describes classroom grouping practices and groups. Refers to number of groups, purpose of groups, forming groups, determining group membership, flexibility of group membership over time, use of aides related to groups.

Physical environment - Describes features of the classroom physical environment. Refers to amount and use of classroom space, furniture arrangement, heat, light, noise level, and traffic patterns.

Learning centers - Refers to the presence of, setting up, provisioning, managing, using, perceived effects of, and quality of learning centers in the classroom. Includes references to use of aides related to learning centers.

Social climate - Refers to social interactions among children and between teacher and child. Includes references to cooperation between children, and teacher knowledge of individual children's strengths and weaknesses, both personal and academic.

Enrichment Activities - Refers to those experiences and people that provide pupil learning opportunities other than the usual classroom instructional activities; examples include: cooking activities, special art, music or drama, field trips, and invited guests in the classroom. Includes references to planning and carrying out enrichment activities and the use of the aide with enrichment activities.

Classroom management - Refers to pupil problem behavior, and includes statements indicating the frequency of problem behavior, the bothersomeness of such behavior, and techniques to prevent and deal with problem behavior.

Monitoring and evaluating pupil progress - Refers to monitoring pupil progress, appraising pupil progress, and giving pupils feedback about their progress.

Morale and attitude toward work as a teacher - Refers to having a positive outlook, being or not being tired, level of frustration and stress, degree of satisfaction, physical health and well-being, and mental health and well-being.

Amount or rate of pupil progress - Refers to amount of material covered, and how quickly pupils grasped the material. Includes references to the aide relative to amount or rate of material covered.

Parent-teacher relationships - Refers to how parents are used, problems with using parents in the class, parent-teacher communication, and home-environmental factors.

Teacher Aides - Includes responses about having or not having an aide, quality of the aide, use of aide or aide duties, and aide characteristics.

Instruction - Includes references to instructional time, purposes, curriculum, instructional goals, teaching methods and techniques, and degree of structure.

Teacher planning and preparation - Refers to planning class activities, preparation of teaching materials or the instructional environment. Includes references to paperwork, copying, duplicating, stapling, record keeping, collecting money, etc.

Individual attention to pupils - Refers to one-on-one attention or instruction to children. Includes references to reteaching and reinforcement of content as well as pupil counseling.

First through third grade teacher interviews. The second year (first grade) interview schedule included the fourteen themes identified from the kindergarten interviews. All first grade teachers were also asked to identify any additional differences not covered in the 14 areas; however, no further differences emerged.

The third year (second grade) interview schedule was developed from significant themes which emerged from the previous two years, and from variables identified from research literature on instruction. The 1988 second grade Teacher Exit Interviews asked teachers to describe differences, if any, that they perceived regarding the following dimensions: (a) amount of content covered, (b) amount of instructional time on task, (c) monitoring children's work, (d) ability to match level of instruction to the ability of individual pupils, (e) pacing of instruction, (f) degree of active pupil-teacher academic interaction, (g) individual attention to children, (h) classroom social climate, (i) demands on available teacher time, and (j) use of full time teacher aide. These ten dimensions emerged from 1986 exit interviews with teachers (Achilles et al., 1987), 1987 exit interviews with Project STAR first grade teachers (Johnston, 1988), and instruction research literature. The fourth year (third grade) interview schedule contained all unique dimensions identified and employed in the earlier kindergarten through second grade interview schedules.

A Summary of Project STAR K-3 Teacher Exit Interviews

Project STAR kindergarten through third grade teachers assigned to small size classes, regular size classes, and regular size classes with a full time aide were interviewed at the end of each school year from 1986 through 1989. The broad purpose of these exit interviews was to identify and describe those aspects of classroom teaching that teachers experienced differently in comparison to the previous year's experience in a regular size class. The results of these interviews provide insights regarding why small size classes and regular/aide classes out performed regular size classes on norm and criterion referenced, standardized measures of reading and math achievement.

Teachers' perceptions of how their experiences differed between teaching in a small size class (1:13-17) or a regular size class with a full time aide (2:23-27), and teaching in a regular size class (1:23-27) were consistent from grade level to grade level. With very few exceptions, the differences reported by K-3 small class and regular/aide class teachers were essentially similar. Interview responses from these two groups differed only in their explanations of the reasons for the differences they described. Small class teachers explained how their teaching had differed in relation to having only 13-17 children, whereas regular/aide class teachers explained how having a full time teacher's aide accounted for the differences they experienced.

An Overview of Regular Size Class Teacher Perceptions

Regular size class Project STAR teachers were interviewed each year along with small class and regular/aide class Project STAR teachers. The purpose of the kindergarten through third grade regular class teacher interviews was to monitor the effect of participation in Project STAR on the normal course of schooling in each project school and grade level. Most K-3 regular class teachers reported that there had been no difference between their teaching experience during the project year and the previous year of teaching. The differences that were described by the

K-3 regular class teachers focused primarily on differences in their work setting and requirements that resulted from their school system's participation in Project STAR.

Random assignment of both children and teachers to small, regular, and regular/aide classes was a strong feature of the Project STAR research design. However, for many schools this design feature mandated changes traditional patterns and practices of grouping children in classes within a grade level. The result of randomly assigning children to classes meant that many kindergarten through third grade teachers who had been accustomed to teaching homogeneous ability grouped classes were now faced with teaching classes that were a heterogeneous mix of low, average, and high ability pupils. This meant that some teachers, who for years had been teaching classes composed only of high achieving children, now had to change their teaching practices to accommodate classes containing middle and low achieving children as well. In some instances, Project STAR's random assignment procedures also caused these teachers, for the first time, to teach classes which contained low achieving Chapter I pupils. Also, for some regular class teachers, their school's participation in Project STAR meant slightly smaller classes than the 25-27 children they normally would have had.

An Overview of Small and Regular/aide Class Teacher Perceptions

Small class and regular/aide class kindergarten, first, second, and third grade teacher exit interviews (1986-89) provide useful insights into two related and fundamental aspects of life in primary grades: the process of instruction, and the classroom learning environment. When small and regular/aide class teachers were asked how their experience teaching a small or a regular/aide class was different from their experience teaching a regular size class, they talked about instructional time in relation to rate of pupil progress, instructional pacing, instructional time on task, and demands on the teacher's available time. They

talked about instructional processes and strategies in relation to planning, grouping, monitoring pupil work, individualizing instruction, and using learning centers and enrichment activities.

Small and regular/aide class teachers also described fundamental differences between the overall classroom work environment in small and regular/aide versus regular size classes. They spoke about the classroom's physical environment, interpersonal relations within the class, parent relations, classroom management, and their own morale as teachers.

Instruction in Small and Regular/Aide Classes

K-3 Small and regular/aide class teachers described two salient differences between their experience of instructing children in small or regular/aide classes, and their experience teaching in regular size classes: availability and use of time, and opportunity to individualize instruction.

Time and Instruction

Time was a dominant theme observed throughout small class and regular/aide class teacher interview responses. The amount and pace of academic content covered was the most pervasive time difference noted by kindergarten through third grade teachers. Most small and regular/aide class teachers reported covering required content faster and covering more content than they had been able to with a regular size class. Teachers reported, for example, covering more required objectives, or completing all grade level reading and math texts. Many teachers explained how they had gone into more depth than ever before. Teachers reported learning that their daily schedule could be more relaxed, and that they would still complete necessary work. This meant, for example, that there were more opportunities to pause and look things up in the dictionary or encyclopedia. They could spend more time discussing a topic, and that more children would have an opportunity to participate.

Variety and appropriateness of learning opportunities. Small and regular/aide class teachers discovered early in the school year that necessary basic instruction required less time, making more time available for other uses. Some teachers used this time as an opportunity to provide a greater variety of learning opportunities for their pupils. For example, teachers described using more manipulative materials and first hand learning activities including learning centers, math/science and health experiments, and social studies projects. Teachers also frequently cited making increased use of enrichment activities such as creative writing, music, art, drama, newspapers in the classroom, and supplemental activities included in adopted reading and language arts texts. Still others used the new available time to cover the required basic material in more depth. These teachers reported, for example, engaging in more frequent and more lengthy discussions with children, spending the time necessary to insure that each child understood the material, more opportunities for children to work at the board, and increased use of reference materials when appropriate.

Regular/aide class teachers explained that the aide was available to spend the time necessary to help provision, monitor, supervise, and clean up projects, hands on activities, and learning centers. Small class teachers related how having fewer children meant that implementing such projects was more manageable, that increased space available for these activities allowed more movement and pupil interaction, and that monitoring and supervision of these learning activities was easier. Both small and regular/aide class teachers felt that having either fewer children or a full time aide made it easier and less risky to provide a wider range of developmentally appropriate learning opportunities for primary grade children.

Individualized instruction. Small and regular/aide class teachers also related the increased amount and rate of content covered to their increased ability to individualize instruction. Because they were not as hurried, because they knew that with a small class or with a full time teacher's aide they could complete the required objectives within the time allowed, pupil papers were more often

checked on the spot, and then immediate feedback and reteaching was provided by the teacher or the aide. They reported spending more instructional time with each child than they had in a regular size class. Teachers reported longer periods of more individualized instruction than they had been able to provide when they taught in a regular size class.

Teachers reported that with fewer children or with a full time aide instruction took less time because pupils were more on task and could get quick help when needed. Teachers attributed this difference to increased ability to monitor pupil behavior and academic progress. They described how management and supervision was easier with fewer children or with a full time aide. They reported that potential off-task behavior could be observed and then nipped in the bud. Teachers reported having a better sense of what was going on in the classroom, of what children were or were not doing. In addition, teachers reported that fewer pupils or an aide meant that during a given instructional period they were more able to provide immediate help, check papers, and reteach if necessary. Teachers reported that when they observed children having problems learning new content, they, or the aide, were more able to provide on the spot individual or ad hoc small group reteaching. Regular/aide class teachers, in particular, felt they were able to deliver unhurried assistance if a child needed it, since the aide was available to monitor and supervise the rest of the class. Small class teachers also noted that they could make more efficient use of available time because they had more specific knowledge about each child's level and instructional needs.

Individualizing Instruction

Increased opportunities for more individualized instruction emerged as a second dominant theme when small and regular/aide class teachers talked about differences between teaching in a small size or regular/aide class, and teaching in a regular size class. These differences became apparent as teachers described instructional processes and strategies in relation to planning, grouping, monitoring pupil work, and using learning centers and enrichment activities.

Planning and grouping for instruction. Most small and regular/aide class teachers reported no difference between planning for a small or regular/aide class compared to a regular size class, though a few reported spending less time in planning. Several small class teachers reported spending more time planning because the class was constantly progressing and needed fresh challenges. Similarly, several regular/aide class teachers reported spending more time planning the aide's work, in addition to their own. Most small class teachers reported using fewer reading groups, and indicated this produced time available for other activities. Small class and regular/aide class teachers also reported that more often than in the past they formed impromptu or specialized groups to better meet more learning levels.

Regular/aide class teachers generally reported that working with groups was easier than when they had no aide assistance. The aide allowed more time for teaching and a greater degree of instructional individualization. Teachers described using the aides to work with individuals and small groups of children who were having difficulty mastering the objectives. Teachers noted that the aide's assistance with clerical and administrative tasks allowed them more time to work with groups. The aides also allowed teachers longer and more uninterrupted periods of small group instruction by monitoring the rest of the class while the teacher worked with the group.

Monitoring and evaluating pupil learning. Most small and regular/aide class teachers reported that monitoring and evaluating pupil progress was easier, required less time, was more efficient, and resulted in greater individual attention than was their experience teaching in a regular size class. The most common explanation offered was that because there were fewer children or a full time aide, papers could be checked on the spot and then each child could be given immediate feedback. Difficult content could be retaught to individuals or small ad hoc groups as needed. Similarly, with fewer children or an aide in the classroom teachers were able to monitor more closely children's work during the act of instruction, so

that monitoring and reteaching were simultaneous. Several small class teachers indicated that they used fewer written tests because they were not necessary since they had more detailed knowledge of each child's progress based on daily work and individual interactions with each pupil.

In most cases small and regular/aide class teachers connected the faster, more frequent, and more individualized feedback to increased opportunities for immediate reteaching. These teachers also related improved monitoring to better ability to match instruction to the needs of above and below average pupils in the class. Second and third grade teachers in particular noted that children who were having problems were more likely to ask questions and request help than in a regular size class. Many teachers also explained that the improved monitoring was also connected to greater opportunities for individualized enrichment activities for children.

A concern expressed by a few small class teachers was that increased monitoring was necessary because small class pupils had come to depend on quick help or feedback from the teacher. One teacher explained that "kids have come to expect more monitoring," and another noted that "children almost demanded more immediate feedback." Another teacher who observed that the children had grown accustomed to the increased attention from and interaction with her, also pointed out that in exchange her children were more willing to ask questions, and more willing to say that they did not understand.

While most regular/aide class teachers reported that they had a better sense of individual pupil progress, a few regular/aide teachers expressed a contrasting concern. Some teachers noted that because the aide was checking most of the papers, the teacher was not as aware of what immediate reteaching was needed by each child.

<u>Matching instructional and pupil ability levels.</u> In general, small and regular/aide class teachers indicated that it was much easier to match the level of their instruction to the level of the pupil's ability than it had been when they

taught in a regular size class. Their explanations for why this was easier related to having more detailed and accessible knowledge of pupil ability levels, and to having the time to provide immediate, individual attention to pupils.

Some second and third grade small class teachers reported that their classes were more homogeneous than any class in the past, so matching the level of instruction was not difficult. Small class teachers reported that in particular it was easier to individualize instruction for pupils having learning problems than it was in a regular size class. Having the time available for immediate monitoring and reteaching was described as critical in this regard. Recall that some teachers perceived pupils in small class to be more willing to seek the teacher's help. Others have observed that in contrast to children in regular size classes, children in small classes acted to adjust the match between the level of instruction and their own ability level by demanding help if they were having trouble.

Regular/aide class teachers described an improved match as a result of the aide working one-to-one with childrenwho were having difficulty learning. They described how the aide contributed to an improved instructional match through increased use of learning centers and enrichment activities. Regular/aide class teachers described how the aide was used as a roving tutor to answer children's questions who were engaged in assigned seatwork while the teacher was leading small reading groups. They described how the presence of the aide to supervise and monitor the class allowed the teacher to work one-on-one or in small ad hoc groups with children who were experiencing difficulties. Finally, regular/aide class teachers described how the presence of the aide provided more detailed knowledge of each child's ability level, thus allowing a more precise match of assignments and ability.

Teacher-pupil academic interaction. Most small and regular/aide class teachers responded that they had experienced significant differences in the degree of active pupil-teacher academic interaction when compared to their experience teaching in a regular size class. Generally small class teachers described that class

discussions were more frequent than in a regular size class and that all children in the class tended to be involved in these discussions. Teachers reported that they employed more higher level thinking activities, and that children had more opportunities to participate. Teachers were better able to insure that all children got a turn, that no one was left out.

Second grade and particularly third grade small class teachers observed that the children appeared to be less inhibited, less afraid of being wrong and that they volunteered to answer questions more often. One teacher observed, "They feel safe with their ideas and they're not going to be put down." Teachers described children in small classes as more curious, enthusiastic, and eager to participate than were children in their regular size classes. Several teachers noted this was particularly the case in their low achieving reading group.

Some regular/aide class teachers related that having two adults in the classroom meant that children could receive twice as much interaction as before. Others described how the presence of the aide resulted in more personal attention to individual children, and improved knowledge of children as individuals. Some regular/aide class teachers explained that the instructional time spent with children was more concentrated because having the aide in the classroom meant that behavior was better and therefore the teacher could devote undivided attention to those children she was teaching.

Learning centers and enrichment activities. Small and regular/aide class teachers reported providing children with learning opportunities beyond traditional whole group and seatwork instructional patterns more often than they had been able to provide when teaching a regular size class. In particular, small and regular/aide class teachers described using more learning centers and implementing activities such as cooking, special art, music, drama, field trips, science and math experiments and demonstrations, social studies projects, creative writing, and parent or volunteer speakers from the community. Teachers reported that because more time was available, they made more use of

such enrichment activities than they had when teaching a regular size class. Teachers also reported making more use of supplemental instructional materials and enrichment activities provided in the adopted reading and math textbooks. Teachers appeared to be more willing to implement complex or messy activities in small size or regular/aide classes because more classroom space was available, and because they, or they and the aide, could adequately monitor and supervise the activity.

Small and regular/aide class teachers also reported having time to make more use of learning centers than they could in a regular size class. Small class teachers noted that with fewer children each child got to go to centers more often and stay for longer periods of time. They observed that the quality of time children spent in centers was better than before, children were not as rushed, there was more available space, and there were fewer children to share limited materials. These conditions contributed to less friction, and fewer discipline problems during center work. Moreover, small and regular/aide class teachers reported improved ability to monitor and supervise children working in centers.

The Learning Environment in Small and Regular/Aide Classes

Teachers experienced fundamental differences in the physical, social, and emotional classroom work environment in small size or regular/aide classes, as compared to their experience in regular size classes. They told interviewers about the classroom's physical environment, interpersonal relations among teacher and pupils, parent relations, classroom management, and their own morale as teachers. Differences in availability and use of time during the school day, and opportunity to know and respond to children on a more individualized basis characterized small and regular/aide class teacher perceptions of their classroom environment.

Interpersonal relations. Small and regular/aide class teachers indicated that they had better knowledge of children as individuals, their families and their home background; that their relations with children were improved; and that children's relations with each other were more positive than they had experienced in a regular size class. Kindergarten through third grade teachers reported that more time was now available to *listen* to children, to get to know their personal lives and concerns. Conversely, teachers also perceived that children knew more about the teacher as an individual with a history, interests, and a life outside of school. Teachers reported feeling more like a part of the class. Small class teachers noted that children were more willing to approach the teacher, that they more frequently initiated conversation with teachers about personal matters.

Differences in relations among children were consistently noted by kindergarten through third grade small class teachers. Small classes were frequently described as like a family. For the most part children in small classes were described as unusually cooperative, supportive, tolerant, and caring. Teachers noted that children stood up for each other, and that children were more willing to take risks in class. Children encouraged classmates to try, to risk, and would not accept less than a good effort from their peers. Small class teachers described their group as more cohesive, and noted that there was less bickering in contrast to their experience teaching in regular size classes. Small class children were described as more relaxed, as more willing to openly express thoughts and feelings.

An unavoidable feature of Project STAR's within school research design meant that children attending small schools serving stable school populations spent four years in a small class with essentially the same fifteen or so classmates. It could be argued that the closeness among children resulted from being together in the same small group for four years. However, kindergarten teachers made the same observations about relations among children, and to the same degree as did their first, second, and third grade counterparts. Some second and third grade

teachers reported that when the small class membership had remained essentially intact for three or four years, children often did not get along well, and were not receptive to new classmates entering the group. This finding appears to be an artifact of the research design, and was not reported in instances where small group membership varied from year to year.

Kindergarten through third grade regular/aide class teachers were overwhelming in their response that there had been more individual attention to pupils as compared to their experience teaching in a regular size class without aide assistance. Teachers reported that children received more emotional and social attention from the teacher and the aide. The pace of the classroom was more relaxed and teachers commented that they were more relaxed and more open to non-academic interactions with children. Teachers did not feel as rushed because the aide was there to handle matters if necessary. Many teachers explained that with two adults in the classroom it was possible for someone to be available to listen to children when they needed to ask an academic question or when they needed to talk about a personal matter.

Classroom Physical Environment. Small class teachers identified increased classroom space, use of classroom space, and lower noise levels when describing the differences between teaching in a small size and in a regular size class. Teachers referred general to "more space" reporting that they kept the same room arrangement but simply spread out more; some citing increased space between children's desks, others noting broader pathways for movement within the room. Teachers reported allowing children more freedom to move about the room than they had in a regular size class.

When small class teachers spoke in detail about how they utilized the increased space resulting from fewer children in the room, they more frequently reported providing more activity/interest/learning centers, as well as increased space for children to work on the floor for art projects, games, reading, and for increased opportunities for children to work in partners and small groups for

independent, cooperative learning. Small class teachers variously described lower noise levels in the classroom, higher levels of productive noise, and their own increased tolerance for noise and movement. It appears that the increased classroom space resulting from smaller class size led to greater flexibility in classroom arrangement, increased numbers of learning and enrichment activities, and in more opportunities to make use of these activities.

Regular/aide class teachers reported that the aide helped to better manage available classroom space by monitoring and directing the traffic flow while the teacher was engaged in instruction. Several teachers noted that the noise level was lower because the aide helped keep things quiet, particularly when the teacher was engaged in instruction. In contrast, some teachers noted that having two adults working in the classroom at the same time resulted in higher noise levels. Some perceived this to be a distraction, others did not mind since it was productive noise.

Managing the behavioral environment. Both small and regular/aide class teachers reported striking differences in their experiences of managing classroom rules, procedures, and pupil behavior in contrast to their experience teaching in regular size classes. The overwhelming comment was that classroom management was easier and that there were fewer behavior problems than in a regular size class. The primary explanation offered by small class teachers for this difference was that with fewer children to monitor it was easier to be aware of potential problems before they became problems. With fewer children teachers reported they could respond faster, and that their response was more considered and individualized. Teachers felt more proactive and less reactive. Regular/aide class teachers attributed differences in classroom management to having a full time aide who could provide more attention to children while the teacher was engaged in instruction. Teachers felt that increased attention from two adults reduced the likelihood that children would try to misbehave. Further, teachers

reported that having the aide present in the classroom meant that problems could be dealt with immediately rather than having to wait for a break in class instruction.

Quality of teacher work life. Small and regular/aide class teachers reported differences in their morale and work attitudes when teaching in small and regular/aide classes in contrast to their experience in regular size classes. Teachers reported that they felt more relaxed, less pressured, and more satisfied at the end of the day. Time appeared to be an important factor in these teachers perceptions of their work life. They felt more less pressured because they knew they would be able to get the required basic instruction completed. They felt more satisfied because they were able to interact more frequently with each child on both a personal and academic level. They felt satisfied because they did not have to be as controlling, and because they had the time to more be flexible in meeting individual pupil needs using more developmentally appropriate approaches. Their satisfaction extended to their home life, with many K-3 small and regular/aide class teachers reported that they did not take as much work home as they had when teaching a regular size class. In sum, small and regular/aide class teachers felt like the were able to accomplish more using more desirable methods, than they could when teaching in a regular size class.

Conclusions From Project STAR Teacher Interviews

Based on four years of interviews with kindergarten through third grade Project STAR small and regular/aide class teachers, the following differences are apparent between instruction in small and regular/aide classes, and instruction in regular size classes. Basic instruction is completed more quickly providing more available time. Small and regular/aide class teachers used this newly available time for covering additional basic material, use of supplemental text and enrichment activities, more indepth instruction regarding the basic content, more

frequent opportunities for children to engage in first hand learning activities using concrete materials, and increased use of learning centers. These patterns emerged in kindergarten and continued through the third grade.

Improved ability to individualize instruction also emerged as a dominant theme in small and regular/aide class teachers perceptions of differences between instruction in small and regular/aide classes and regular size classes. Again citing extra available time as the crucial factor, small and regular/aide class teachers reported increased monitoring of pupil behavior and learning, opportunities for more immediate and more individualized reteaching or enrichment, more frequent interactions with each child, and a better match between each child's ability and the instructional opportunities provided. Small and regular/aide class teachers perceived that they had a more detailed and accessible knowledge of each child's needs as a learner, moreover, they felt like they had more time available to meet individual learner's needs using a variety of instructional approaches. Small class size or the presence of a full time teachers aide fostered the increased use of learning approaches generally considered by educators to be highly desirable, developmentally appropriate primary grade practices.

Significant reduction of class size, or the addition of a full time teacher's aide also makes positive changes in the physical, social, and emotional environments in primary grade classrooms. Classrooms are more humane and pleasant work environments for both teachers and children. Teachers and children are under less stress and learning occurs in a more relaxed atmosphere. Children are less likely to get lost in the crowd, and are more likely to have their own unique needs met by adults who have a better understanding of them as individuals. The extent to which teachers, aides, and children are friendly, supportive, and trusting of one another is an indication of the peer cohesion of children and the esprit de corps of the group as a whole (Johnston & Davis, 1989). Further this dimension is an indicator of classroom morale and sense of team spirit and is known to be characteristic of effective elementary schools.

Class Size, Teacher/Pupil Ratio, and Developmentally Appropriate Practice in the Primary Grades

One index of the quality of primary education is the extent to which the curriculum and instructional practices are developmentally appropriate (congruent with knowledge of child development) for children 5 through 8 years of age. In operation the concept of *developmental appropriateness* suggests that teachers use child development knowledge to identify the range of appropriate behaviors, activities, and materials for a specific age group; and then apply this knowledge in conjunction with understanding about individual children's growth patterns, strengths, interests, and experiences to design the most appropriate learning environment, content, and teaching strategies (Bredekamp, 1987).

To explore the relationship between small size classes or the use of full time teacher aides and developmentally appropriate practice in the primary grades, it may be useful to think in terms of a continuum with more appropriate practices being those that move in the direction of greater congruence with, and support from child development knowledge. In contrast, less appropriate practices would be those that are not well supported by, or that are in conflict with knowledge of child development. The K-3 Project STAR teacher interview data provide both wide perspective and fine grained accounts of how teaching smaller size classes or with a full time teacher's aide affects the developmental appropriateness of professional practice in public school primary grade classrooms.

The remainder of this paper considers how the reduction of teacher/pupil ratio, through the use of teacher aides or through assignment of fewer pupils to each class, changes the developmental appropriateness of curriculum and adult-child interactions in kindergarten through third grade public elementary school classrooms.

Class Size and its Effect on Curriculum

Curriculum is an organized component framework that details learning and developmental goals for children, the learning processes through which children accomplish these goals, what teachers should do to help children achieve these goals, and the context in which learning and teaching occur (Katz, 1985). These curriculum components should be appropriate for the age span of the children within the group, and should be implemented with attention to the unique needs of the individual children in the group. Project STAR K-3 teacher exit interview responses are considered below in relation to general guidelines for developmentally appropriate curriculum practices (Bredekamp, 1987).

During the past decade, primary grade elementary education in Tennessee has been largely organized around a state-mandated, structured set of reading, language, and math basic skills. Teacher evaluations were, and in many cases still are, tied to adherence to the exact sequence, pace and content of this curriculum. Minimal attention is given to content and experiences beyond the narrow basic skill perspective of this curriculum. Limited classroom time and space are spent to support achieving physical, emotional, and social developmental goals. Integration of subject matter content is not promoted by a basic skills curriculum. Teachers feel as if they are under great pressure to complete specific reading, language and math objectives. Teachers do not perceive that integration through project or theme studies is a realistic option given the press of time and the number of basic skill objectives that must be mastered each day.

Reduction of class size or the presence of a full time teacher's aide appears to have resulted in increased positive attention to children's social and emotional growth and development. Small and regular/aide class teachers reported that they were more cognizant of children's individual social and emotional needs and problems than they had been in the past. These teachers reported that more available time meant increased opportunities for social interaction between adults and children. Throughout the four years of interviews, small and regular/aide

class teachers reported that they had more opportunities to *listen* to children talk about their lives. They also explained how they were able to incorporate this new understanding of children into their instructional plans.

Reduction of class size or the presence of a full time teacher's aide appears to have had only minimal impact on changing instructional practices mandated by the curriculum. For the most part, all teachers followed the curriculum as they were expected to do. However, smaller classes and teacher aide's did result in increased use of a wider range of enrichment activities than reported by regular class teachers. For example, both small and regular/aide class teacher's described instructional units incorporating more cooking experiences, special art, music or drama, and invited guests.

Reduced class size and reduced teacher/pupil ratio appears to result in teachers having more opportunities to get to know children as individuals with needs, abilities, and interests beyond the classroom. This increased knowledge encompassed both children's academic performance and personal life. One teacher told the interviewer, "I know more about what types of homes they come from because I get to talk to them before school and at recess, and I get to know them as individuals." Several teachers stated that generally there was more time to get to know children, others remarking specifically that there was more time to listen to children. For example, "Because I have fewer children, I have more time to listen to them talk, to let them talk, and to remember details about them and their lives away from school." Small class teachers clearly knew more about the personal lives of children in their classes than they did when they were regular class size teachers. The extent to which this knowledge was used to broaden the curriculum for all children was not revealed in the K-3 interviews.

Small class teachers also reported having a more immediate knowledge of each child's particular learning needs. Some teachers reported giving fewer written tests because they were not necessary since teachers knew more about the

level of each child based on more frequent one-to-one monitor/reteach episodes. In this sense, assessment of individual needs, strengths, and interests was more frequent in small classes than in regular size classes.

As noted above, the highly structured basic skills approach dominating primary education in Tennessee mitigates against learning through active exploration and interaction with other children. However, both small and regular/aide class teachers reported using more learning centers, more hands-on learning experiences, and more small group activities than they had when teaching regular size classes. Teachers not only reported that more centers were available, but that children had more time to use the centers. Moreover, the quality of the time children spent in the centers was more productive.

While workbooks and ditto sheet drill and practice are still the primary instructional method employed by most K-3 teachers, small and regular/aide class teachers reported using more concrete learning materials, and more hands-on activities than they had in the past. They described, for example, an increased use of games, science experiences, art activities, creative writing, and drama.

The narrow confines of the prescribed basic skills curriculum does not accommodate a wide range of developmental interests and abilities. However, small and regular/aide class teachers reported that because they had time and more opportunity for individual instruction, children who were having great difficulty learning the required basic skills could be accommodated. A number of small class teachers explained that they had been able to avoid retaining children in grade because they were able to provide more attention to those children. Similarly, a number of teachers reported that they were better able to meet the needs of children whose knowledge and skills were beyond the range of the specified curriculum. In sum, reduced class size and reduced teacher/pupil ratio contributed to teachers being able to better meet the needs of children outside the range of the basic skills curriculum.

Small class and regular/aide class teachers reported that they provided a richer variety of activities and materials than they had in the past. Children in these classes had greater access to a greater number and variety of learning center activities. Both small and regular/aide class teachers reported making greater use of small group and individual activities. Regular/aide class teachers reported that the aide contributed to provisioning and monitoring of learning centers and special activities. As learning centers are more numerous and their use more extensive, there are increased opportunities for children to have their own learning needs met.

Summary of class size and its effect on curriculum. Class size reduction and the use of full time teacher aides does move curriculum in the direction of developmentally appropriate practice, and away from practices considered inappropriate. The effect, however, appears to be limited, particularly by the presence of a single, highly structured curriculum organized around direct instruction of reading, language, and math basic skills. Class size reduction or the use of full time teacher aides does contribute to increased opportunities for children to select from a somewhat wider range of learning activities; they contribute to a more individualized application of the mandated curriculum; they contribute to increased teacher awareness of their pupil's social and emotional development; and they contribute to increased opportunities for children to interact with each other while engaged in learning activities. Moreover, small class sizes or the use of full time aides appear to contribute to richer content and more indepth coverage of subject matter content.

Class Size and its Effect on Adult-Child Interactions

Bredekamp (1987) asserts that the developmental appropriateness of an early childhood program is most apparent in interactions between adults and children. Kindergarten through third grade teacher interview responses do reflect positive changes in the developmental appropriateness of adult-child interaction when

class size is significantly reduced, or when a full time teacher aide is provided. These changes are apparent in instructional interactions and in personal non-academic interactions.

Adult-child instructional interactions. The most prominent change perceived by K-3 small class or regular/aide class teachers was an increase in the extent to which they were able to individualize instruction. As discussed above, within the bounds of a mandated, highly structured basic skills curriculum, these teachers reported that they were able to address a wider range of individual learning styles by using more learning centers, more concrete learning materials and activities, and more projects than when they had taught a regular size class. Both small and regular/aide class teachers reported using more small groups. Small class teachers reported allowing children to use a variety of work places as more space was available in the classroom. Teachers felt they were able to tap a wider range of individual pupil interests because they could go beyond the mandated basic skills reading, language, and math basic skills curriculum to provide children opportunities for science, social studies, and fine arts content. Because small class size teachers had more instructional time available, they were able to respond to each child more frequently, and were able to engage in instructional interactions beyond a simple teacher question/pupil response cycle. Teachers reported that they had more time for extended, indepth questions and conversations.

Instructional interactions in small size classes appeared to be based on an improved level of teacher knowledge about the exact performance level of the children. Teachers reported that they were better able to monitor each child's work, and were able to provide more immediate, more frequent, and more extended feedback to each child. Some small class teachers reported that they did not have to consult their grade book in order to know the level of children's performance. Instead, teachers reported that because of the more frequent and

more indepth teach/monitor/feedback cycle possible with fewer children, they were able to immediately recall each child's learning performance level, and to respond based on that knowledge.

Both small class size and regular/aide class teachers reported that they were able to respond more quickly and more appropriately to children who needed assistance with assignments than they had been able to in a regular size class. With fewer pupils in the class or with the presence of an aide, children did not have to wait as long to receive help from an adult. Children's questions could be answered more quickly. Responses to children were more individual and private. Teachers reported that they, or their aide, were able to spend more time with children who needed assistance. Adult-child interactions were more relaxed and less hurried.

Adult-child interpersonal interactions. Both small and regular/aide class teachers reported differences in their ability to respond to personal (non-academic) needs of the children in their classes. The pace of classroom life was perceived to be more relaxed. Small class teachers felt less time pressure, and regular/aide class teachers noted that with two adults in the classroom it was more likely that an adult would be available to listen to children when they needed to talk about a personal matter.

There is some evidence, particularly from small class teachers, that children had more opportunity to communicate with the teacher and that children also had more opportunity to communicate with each other. Teachers reported providing children more opportunities to work together in small groups. Some small class teachers reported that because there were fewer children present in the classroom, that they were able to allow more talking among children. Some small class teachers reported higher noise levels than in the past, but noted that this was not a problem because the noise seemed to be more productive. Some small class teachers reported that with fewer children it was not as necessary to maintain tight

control of children's movement and interaction. Again, small class teachers reported that because classroom life was more relaxed they tolerated more movement and interaction.

Adult-child interactions regarding children's behavior emerged as a major area of difference between teaching in regular size classes and teaching in small size or regular/aide classes. The overwhelming response from small and regular/aide class teachers was that there were fewer discipline problems than they had experienced in a regular size class. When discussing why there were fewer discipline problems in a small class, several themes emerged. The most frequent explanation was that with fewer children and desks in the classroom, there was more physical space between children. Thus, it was not as likely that children would talk to each other, disturb each other, or jostle others when moving about the classroom. Some teachers pointed out that with more classroom space it was easier to physically isolate children with behavior problems.

A second explanation for the decreased number of discipline problems was that with fewer children it was "easier to stay on top of things." By this teachers meant that it was easier to scan the classroom to monitor pupil behavior. Teachers reported that children were aware that teachers could watch them more closely, and were therefore less likely to misbehave knowing there was a high probability that the teacher would catch them. Teachers also reported that they were able to deal with problem behavior right away, that they were "able to catch small things before they could escalate." This may have contributed to less misbehavior since children knew that not only was there a higher probability that the teacher would see them, but also that the teacher would take immediate action to deal with the misbehavior. Teachers also mentioned increased available time as a factor contributing to their increased "With-it-ness." As one teacher described, "I had more time to prevent behavior problems from happening and more time to deal with them if they did."

A third explanation for decreased misbehavior revolved around individual attention. Several teachers explained that they had more time to work with each individual child, noting that children learned that they would all get attention from the teacher. As one teacher explained, "The kids knew that they didn't have to act up to get my attention." Other teachers reported that they were able to pay more individual attention to children who had behavior problems, particularly those with more serious or difficult problems. Increased communication with parents was one aspect of this individual attention, both to inform parents about positive as well as problem behavior.

There were several positive outcomes that resulted from teachers' ability to manage their classes so there was less problem behavior. Several teachers reported using less corporal punishment than they ever had before. Others indicated that they gave children more freedom to talk quietly and move about the room since it was easier to monitor children's behavior and to deal immediately with problem behavior. Both small and regular/aide class teachers described how they were able to respond to a child's problem behavior in a more private and individualized fashion than when they were alone in a class of 25 or so. The more relaxed pace of classroom life allowed teachers the opportunity to talk with children about persistent or difficult problems. Teachers felt they had a better understanding of children as individuals and of their life outside of school, because of this they felt they were better able to solve behavior problems rather than simply control or repress them.

Summary of class size and its effect on adult-child interaction. Significant reduction of class size or the presence of a full time teacher's aide appears to make a positive contribution to the developmental appropriateness of adult-child interactions in the primary grades. Within the confines of a structured, highly prescribed reading, language, and math basic skills curriculum, K-3 classes of about 15 children or classes of 25 children with a teacher and a full time paraprofessional seem to foster instructional interactions that are more

individualized than does the more traditional class size of about 25 children with a single teacher. Small class teachers are more knowledgeable about the instructional needs of the children in their classes. Small and regular/aide class teachers are more likely to report employing teaching strategies that are considered to be developmentally appropriate than do teachers in regular size classes of about 25. Small size classes, and to a lesser extent regular/aide classes foster more developmentally appropriate non-academic interpersonal interactions between adults and children and among children themselves.

Conclusion

Interviews with kindergarten, first, second, and third grade teachers regarding their experiences teaching a small class, or teaching a regular size class with a full time teacher's aide provide important insights into relations between class size, adult-child ratio, and developmentally appropriate practice. Teachers' perceptions, descriptions, and explanations of their experiences strongly suggest that classes of about 15 children, or class size of 25 children with a teacher and a paraprofessional, do indeed contribute to educational practices that are supported by knowledge of child development. Teachers' perceptions of their experiences indicate that small size classes and regular size classes with a full time aide does contribute to a primary grade experience that is more congruent with the overall developmental and learning needs of five through eight year olds.

However, it is also apparent from the Project STAR teacher interviews that either reduction in class size or the addition of a full time teacher's aide resulted only in changes of degree rather than changes of kind. The teacher interviews support Mitchell et al's (1989) conclusion in their extensive analysis of class size literature, "Teachers did not change their basic approach to classroom management or to the curriculum. They were, however, able to do more or better what they had already intended" (p. 49). In order to make the most of primary grade group size and staffing guidelines advocated by the National Association for

the Education of Young Children (Bredekamp, 1987), it will be necessary to educate teachers in methods that will allow them to make optimal use of small classes or to work with an aide. In addition, it is likely that organizational approaches to lowering class size such as scheduling and staffing will have to be explored given the prohibitive cost of significant class size reduction (Mitchell et al., 1989).

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